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Microsoft

October 31, 2019

VIA ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20554

Re: ET Docket No. 14-165 and RM-11840; WC Docket No. 19-195; WC Docket No. 11-10; ET Docket No. 16-56; GN Docket No. 14-166; GN Docket No. 12-268, GN Docket No. 16-142; MB Docket No. 15-146; MB Docket No. 16-306, RM-11745

Madam Secretary:

In accordance with Section 1.1206(b) of the Commission's rules,[1] this letter provides notice of an oral ex parte presentation to the Commission in the above-captioned dockets. On October 29, 2019, undersigned counsel, along with Paul Garnett and Allen Kim of Microsoft Corporation, met with Michael Janson, Nathan Eagan, Kirk Burgee, Pramesh Jobanputra, Jonathan McCormack, Patrick Sun, Jeffrey Prince, Lauren Garry, Katie King, Susan Mort, Steven Rosenberg, Alex Minard and, telephonically, Audra Hale Maddox, Kelly Quinn, Catherine Matraves, and Murtaza Nasafi.

In its presentation, Microsoft discussed several aspects of the Report and Order and Second Further Notice of Proposed Rulemaking addressing the upcoming Digital Opportunity Data Collection.[2] This presentation was consistent with that previously provided to the Commissioners' advisors and Commission staff.[3]

[1] 47 C.F.R. § 1.1206(b).

[2] *Establishing the Digital Opportunity Data Collection*, *et al*., WC Docket No. 19-195, *et al*., Report and Order and Second Further Notice of Proposed Rulemaking, FCC 19-79 (rel. Aug. 6, 2019).

[3] *See, e.g.,* Letter from Paula Boyd, Senior Director, to Hon. Marlene H. Dortch, (Sept. 20, 2019) at https://www.fcc.gov/ecfs/filing/10921055962128.

Microsoft also discussed its Airband Initiative, including its petition for rulemaking, which proposes improvements to the Commission's Television White Spaces technical rules.

Copies of slides provided at the meeting are enclosed for the Commission's reference. Should you have any questions, please contact the undersigned directly.

Sincerely,

MICROSOFT CORPORATION

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Enclosures

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Audra Hale Maddox
Kelly Quinn
Catherine Matraves
Murtaza Nasafi
Paul Garnett
Allen Kim

Microsoft Rural Airband Initiative

Connecting the Unconnected

October 29, 2019

Microsoft

Solving Big Challenges

Internet Access

Nearly 49% of the world is not using the internet[1]

Energy Access

1.1 billion people worldwide lack access to electricity[2]









"With no internet access, there is no cloud access." - Satya Nadella

1. Source: ITU, 2018; 2. USAID, 2019

The connectivity gap in the United States

At least

21.3 million people

lack access to broadband[1]

At least

16.8 million people

reside in unserved rural communities[1]

1. Source: FCC Broadband Deployment Report, 2019

Airband Initiative mission – connect the unconnected

We partner with equipment makers, internet and energy access providers, and other stakeholders to make affordable broadband access a reality for unserved communities around the world.

3 Million

People projected to be covered in **rural U.S.** by July 2022

40 Million

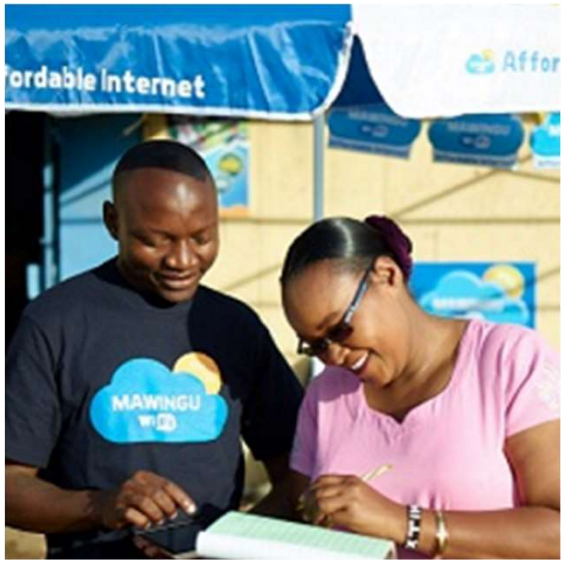
People projected to be covered **globally** by July 2022

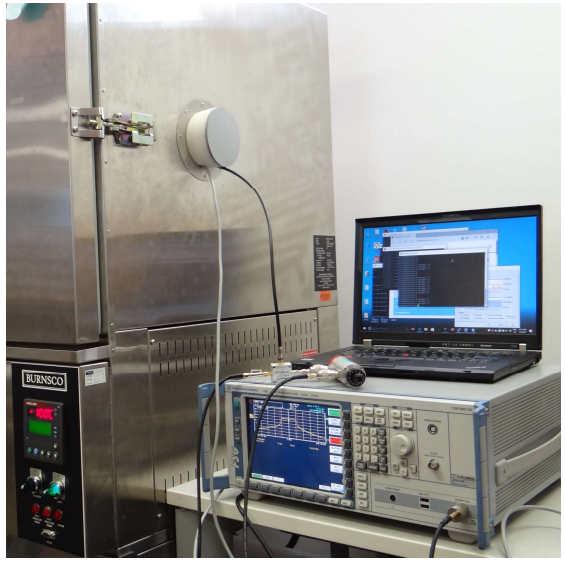
Our approach

Incubate seed stage partnerships and projects

Develop enabling technology ecosystems

Commercialize scalable technologies and deployments





Focus areas

Healthcare
Telehealth services such as remote monitoring and videoconferencing can improve health outcomes while reducing costs

Agriculture
Farmers can boost income by finding new customers, improving productivity and reducing costs through technology

Education
Schools can expand learning options, offer virtual courses, and enable remote collaboration

Small business
Small businesses can use broadband to work remotely, provide more services and reach more customers around the world

Airband partnerships and programs

Commercial Partnerships

Rural America ISPs

International ISPs

International energy access providers

Hardware and component manufacturers

Independent Software Vendors

Strategic Partnerships

Tower, fiber, and other infrastructure providers

Government agencies

Corporate partners

Industry groups

Airband ISP Program

(no barrier to sign-up)

Hardware and component manufacturers

Telco and ISP infrastructure providers

Independent Software Vendors

Airband USA strategy

Goals:

- **Invest in projects, partnerships, and programs** to **cover 3 million unserved people** in rural America by July 4, 2022
- **Inspire others** to deploy innovative technologies and business models that will close rural America's digital divide once and for all

How:

- **Co-investment** in broadband deployments – hybrid wireless networks
- **Digital skills** for all ages
- **Royalty-free access** to TV White Space technology patents and source code

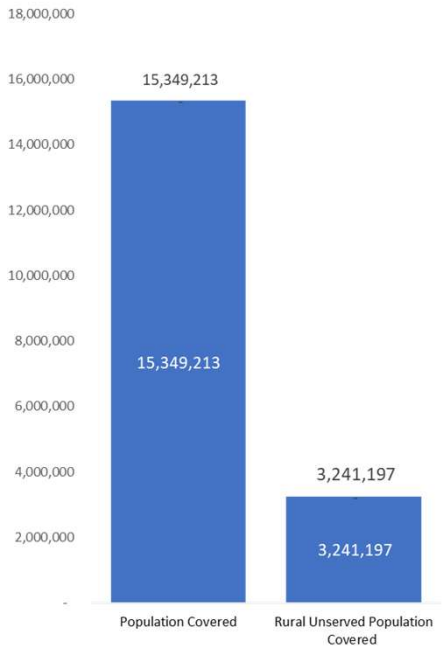
Policy Needs:

- Encourage the FCC to ensure **sufficient TV white spaces** is available nationwide and especially in rural areas
- Ensure that **public sector funds**-grants and loans for network operators-are available and targeted to unserved communities
- Work with the FCC to **improve rural broadband coverage data**

US Overview

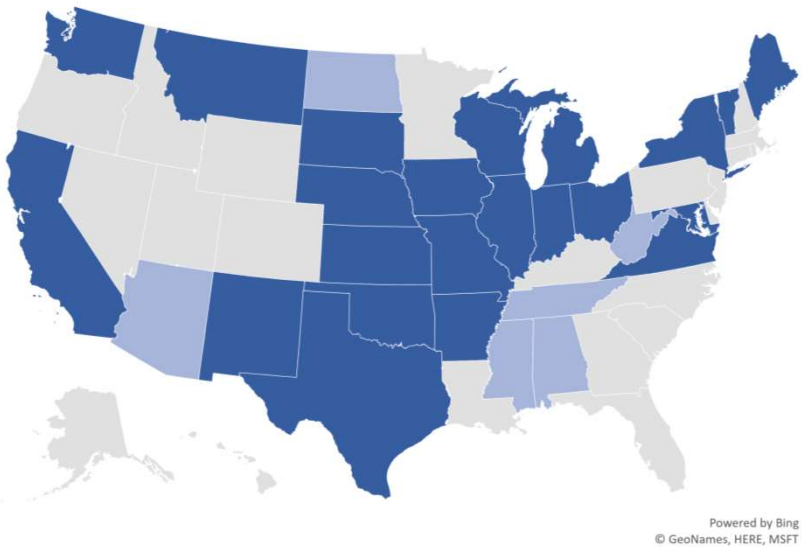
The overall goal is to cover 3 million people in unserved rural USA by July 4, 2022

Projected Population Under Coverage by **July 4, 2022**, Based on Current Airband Partnerships



States Covered

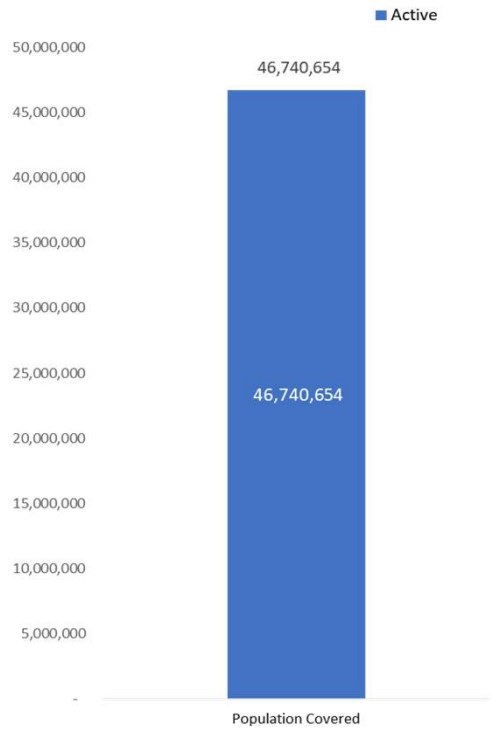
Pilot/Grant	Commercial
5	22



International overview

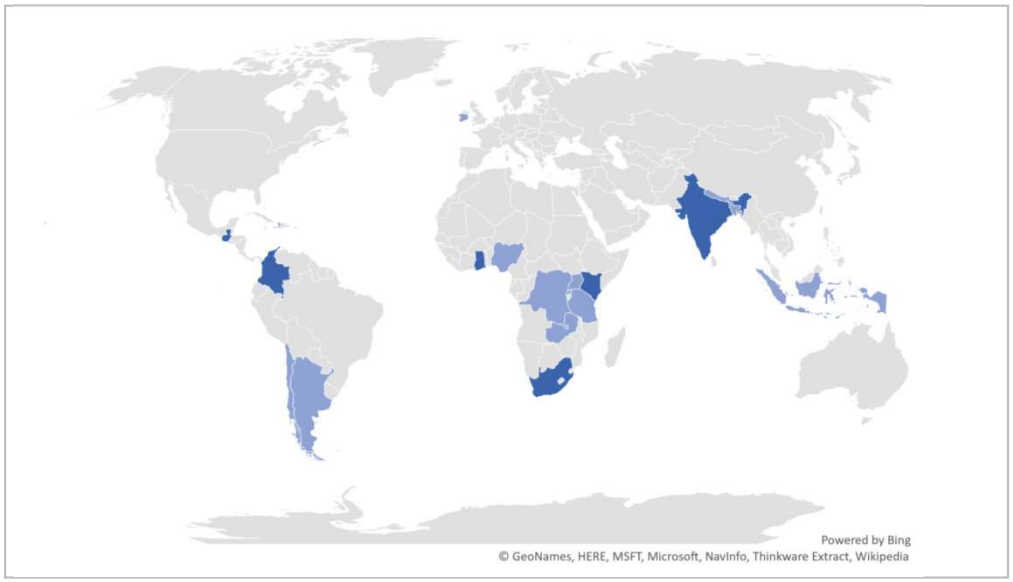
The overall goal is to cover 40 million people in unserved rural areas globally by July 2022

Projected Population Under Coverage **by July 2022**, Based on Current Airband International Partnerships



Countries Covered

Pilot/Grant	Commercial
13	6



Cal.net

After obtaining an experimental license through the FCC and conducting testing with the first commercially feasible hardware, Cal.net Inc. leverages the latest TV white space technology to **provide broadband access to over 41,000 unserved rural customers** across the western region of the Sierra Nevada Mountains.

Cal.net

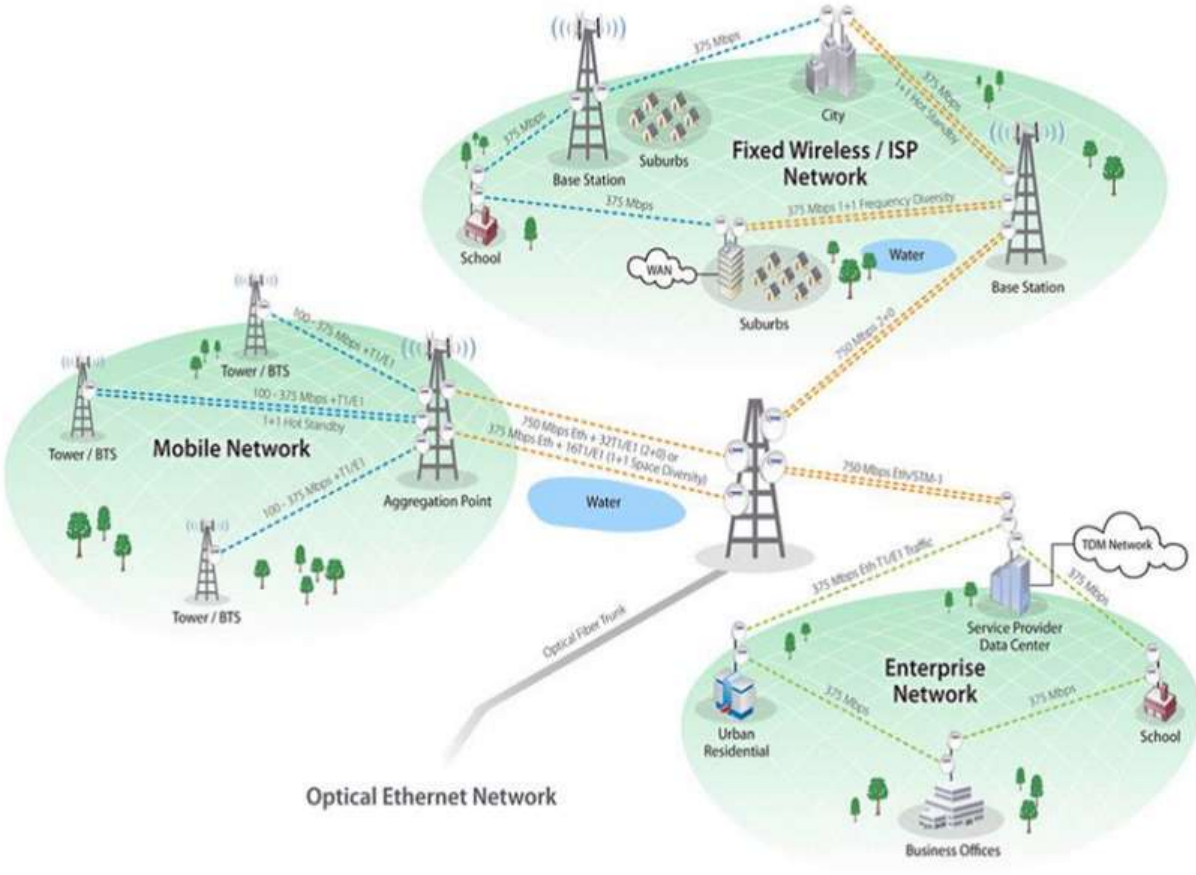
Declaration Networks

Declaration Networks is changing the way families, small businesses, farmers, and others thrive in rural communities along the Eastern Shore of Virginia and in Garrett County, Maryland.

By using a fixed wireless network leveraging 5Ghz and TV White Space, they plan to provide broadband connectivity to **approximately 65,000 people by 2021.**

DECLARATION NETWORKS

Hybrid Network Topology



- Fiber
- Microwave
- Wi-Fi
- mmwave

→
- Urban
- Licensed/Unlicensed
- LOS
- Wireless + Wired

- 3.5GHz
- 5.8GHz
- Satellite

→
- Urban/Rural
- Licensed/Unlicensed
- LOS
- Wireless

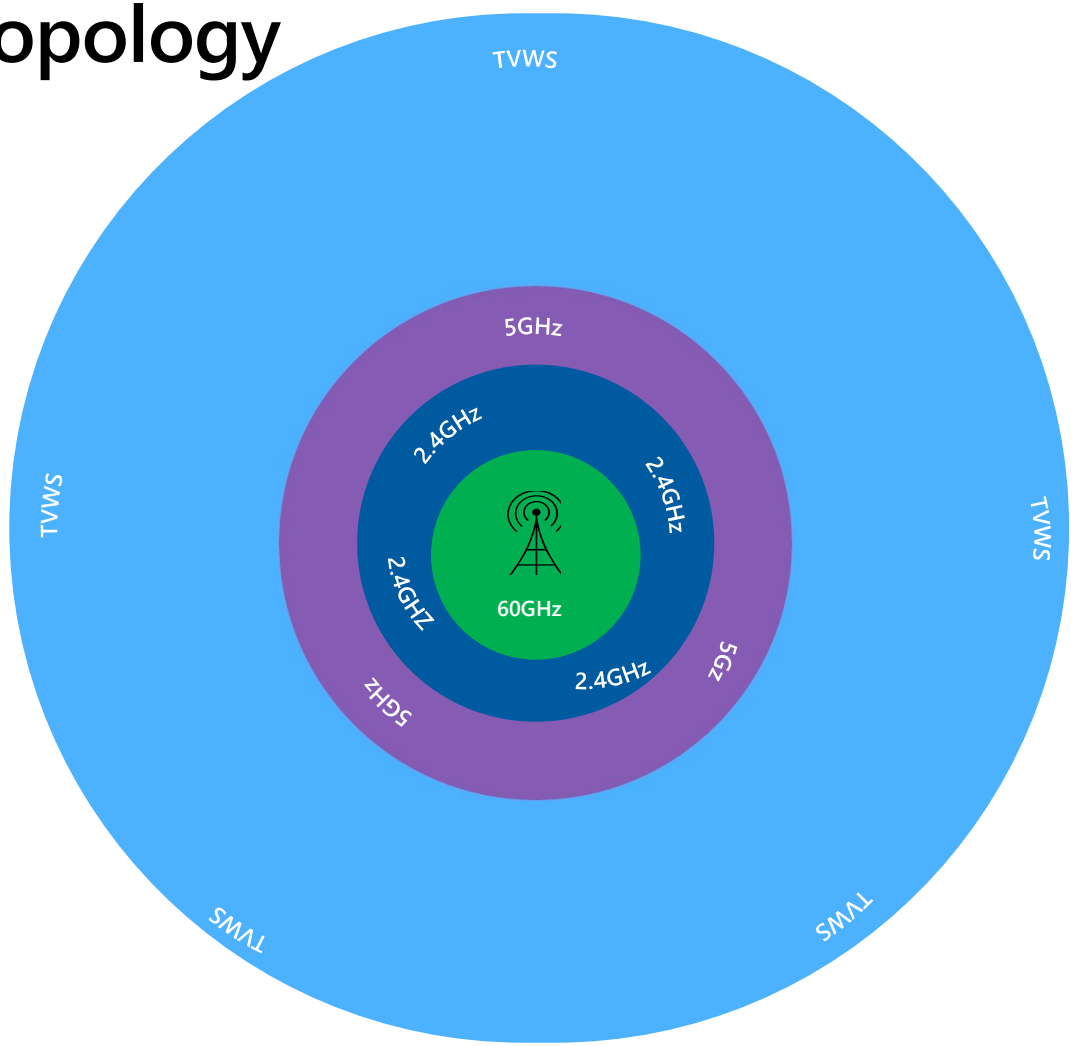
- TVWS

(470 -698 MHz)

→
- Urban + **Rural**
- Unlicensed
- LOS + **NLOS**
- **Wireless**

Technology selection depends on use cases, coverage, and capacity requirements.

Achievable Coverage and Performance Based on Hybrid Topology



60GHz: mmWave (2000MHz Bandwidth)

1000Mbps **Features:** 0.1miles range, 2000MHz bandwidth, 10000Mbps maximum throughput

2.4GHz: Wi-Fi (40MHz Bandwidth)

300Mbps **Features:** 0.15miles range, 40MHz bandwidth, 300Mbps maximum throughput

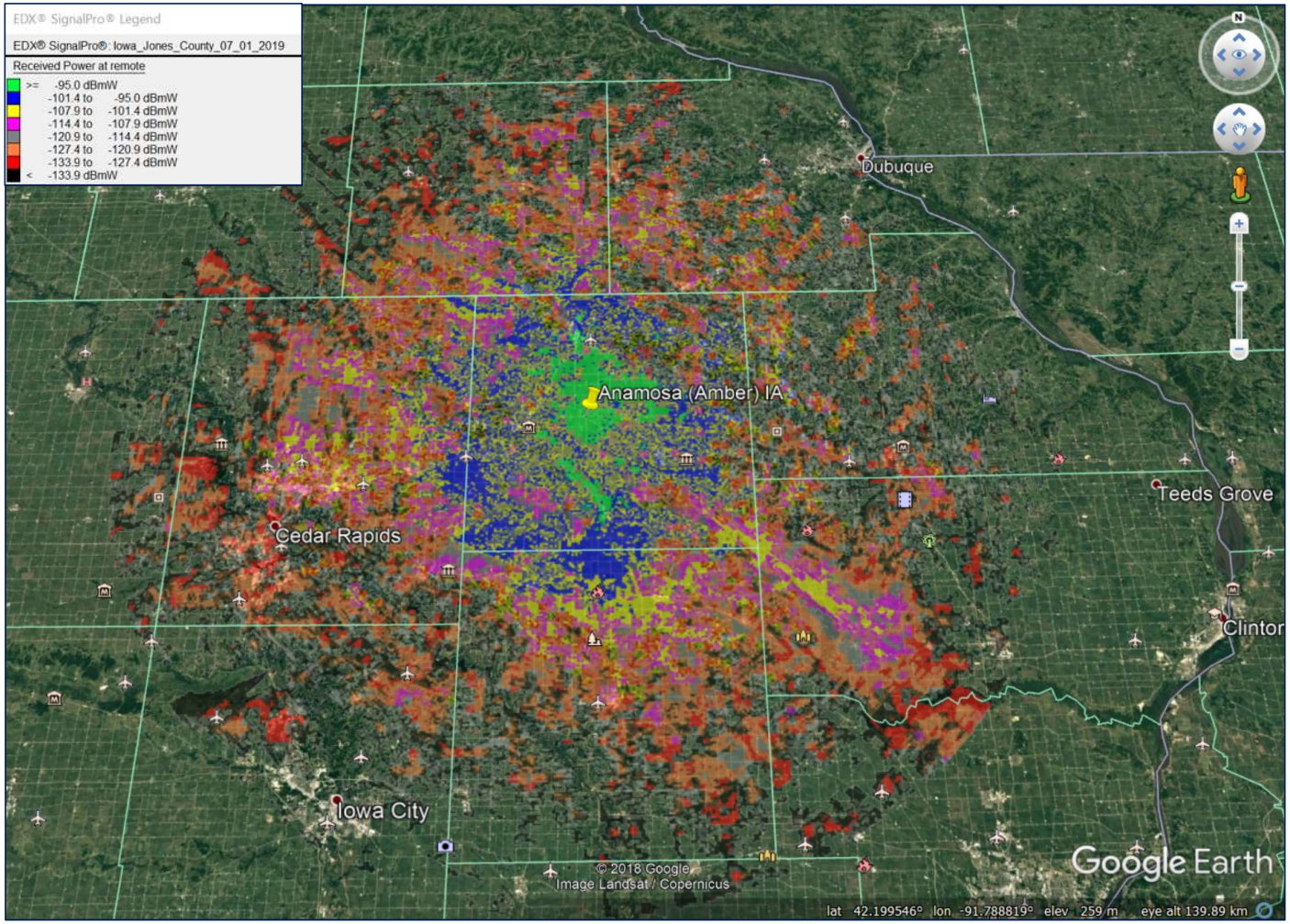
5GHz: Mid band (80MHz Bandwidth)

1200Mbps **Features:** 1.25miles range, 80MHz bandwidth, 1200Mbps maximum throughput

TVWS: Television white spaces (24MHz Bandwidth)

100Mbps **Features:** 6 miles range, 24MHz bandwidth, 100Mbps maximum throughput

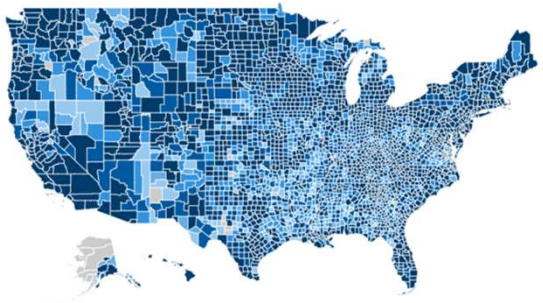
FarmBeats Agriculture Pilot in Jones County, Iowa – TVWS Narrowband IoT Propagation Study



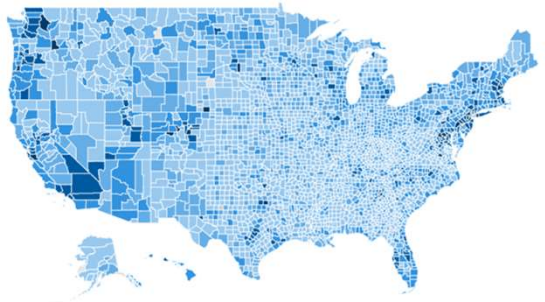
Broadband usage based on Microsoft data

- FCC reports 93.5% of the country has access to fixed broadband at a minimum of 25 Mbps/3Mbps; Microsoft estimates ~49% of people access the internet at broadband speeds
  - Availability does not equal usage; however usage gives us the ground truth in the progress we are making in broadband adoption.
  - Through artificial intelligence and machine learning models using device level (no PII) data (over 200+ Microsoft services) we estimate download speeds and broadband coverage
  - We make a very minor adjustment in areas of the country that Microsoft may not have a presence with third party data i.e. ComScore

FCC indicates broadband is available to 93.5% of people



Microsoft indicates 49.5% of people use the internet at broadband speeds



* FCC fixed broadband has or "could" provide greater than or equal to 25Mbps / 3Mbps

Broadband speed greater than or equal to 25Mbps

Data sources: FCC 2019 Broadband report based on Form 477 data from December 2017 and Microsoft data from September 2018

Objective of the analysis for outlier zip codes

Microsoft

- Hypothesis: If we can find zip codes with inaccuracies in availability data in an automated way using machine learning this could help the stakeholders to correct data inaccuracies.
- Utilizing further machine learning to predict availability, we have created a model to identify a subset of zip codes that MAY have inaccuracies.
- There is no guarantee that these zip codes are being reported inaccurately; however based on using a machine learning model and additional validation with a third-party survey done by BroadbandNow, these identify areas of potential inaccuracies.
- Our plan is to make the model publicly available on GitHub and the output publicly available in the near future.

Methodology

Microsoft

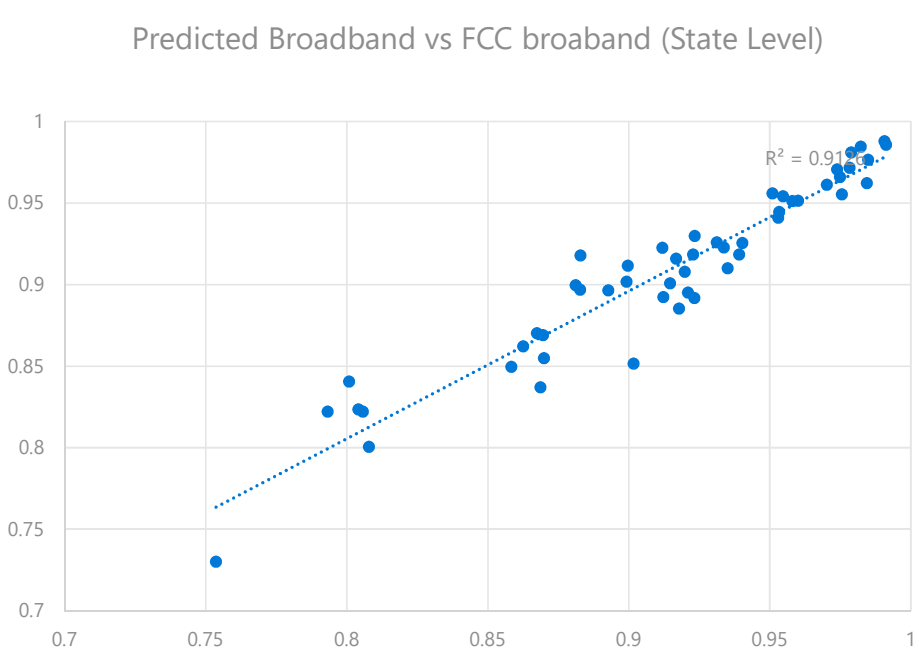
- Developed Machine Learning models (random forest for regression) to predict broadband availability in order to identify potential outlier zip codes when compared to the form 477 data submitted to the FCC.

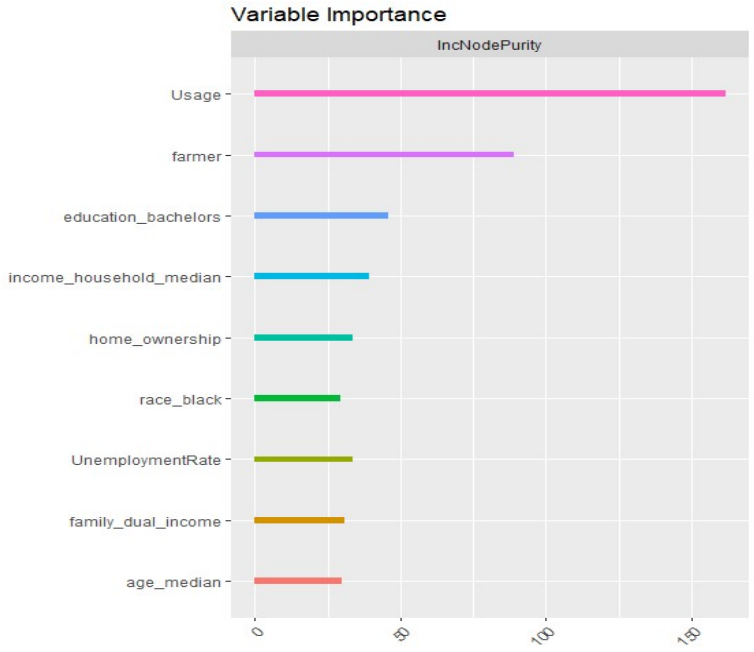
- We take the FCC availability data at the census tract level and estimate to zip codes.

- Data sources:
  - FCC Form 477 (grouped by zip code)
  - Broadband usage based on Microsoft data
  - Census data by zip code
  - Broadbandnow.com data
  - HUD census tract to zip code crosswalk

Predicting broadband availability

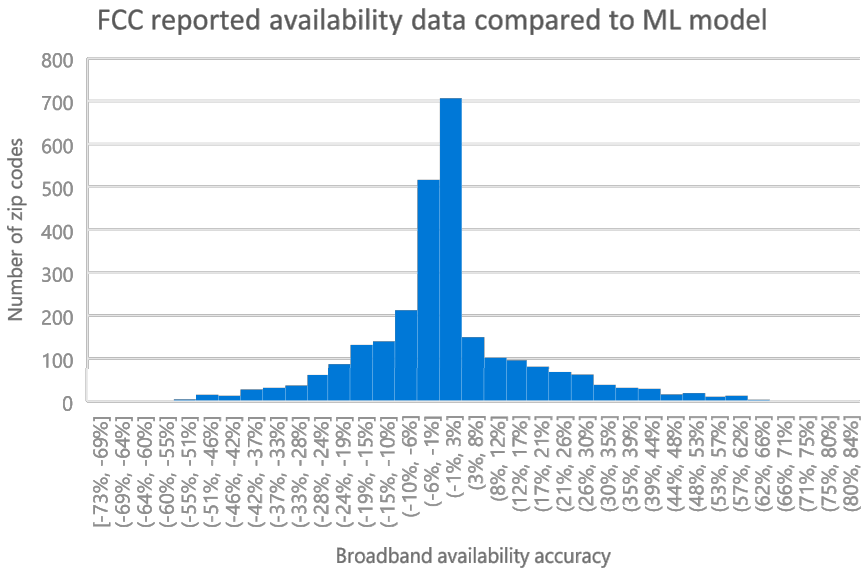
- We use a random forest model and measure variable importance.
- Broadband usage is the #1 variable with the highest predictive power followed by percent of farmer and educational attainment.
- At the state level this model can predict with an r^2 of 91%.

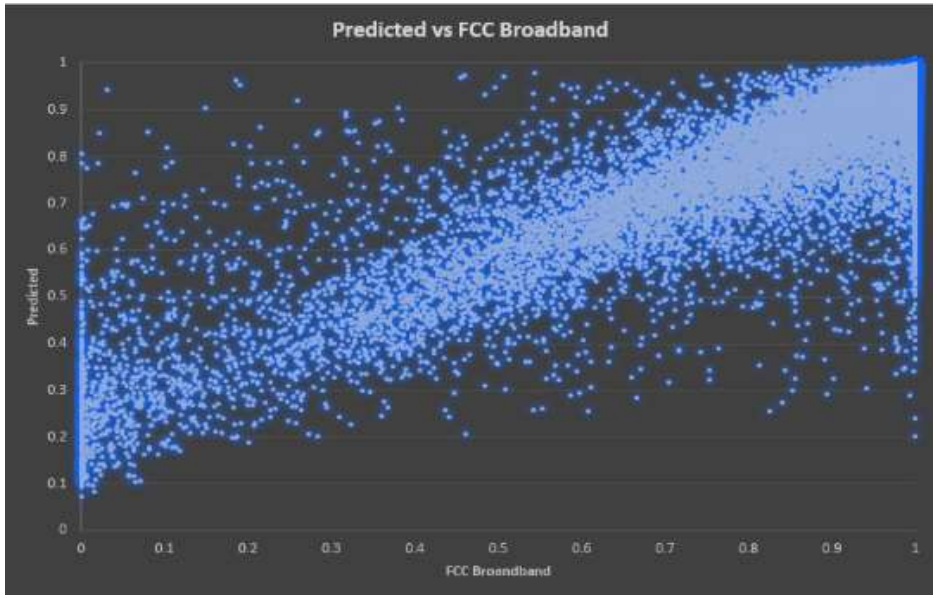




Ability to detect potential outliers

- We use this model to detect potential outliers with the highest divergence (positive and negative) to the reported broadband availability
  - ML model predicts 63% of zip codes within 5pts of reported broadband availability
  - ML model predicts 78% of zip codes within 10pts of reported broadband availability





Top 20 potential outlier zip codes

Microsoft

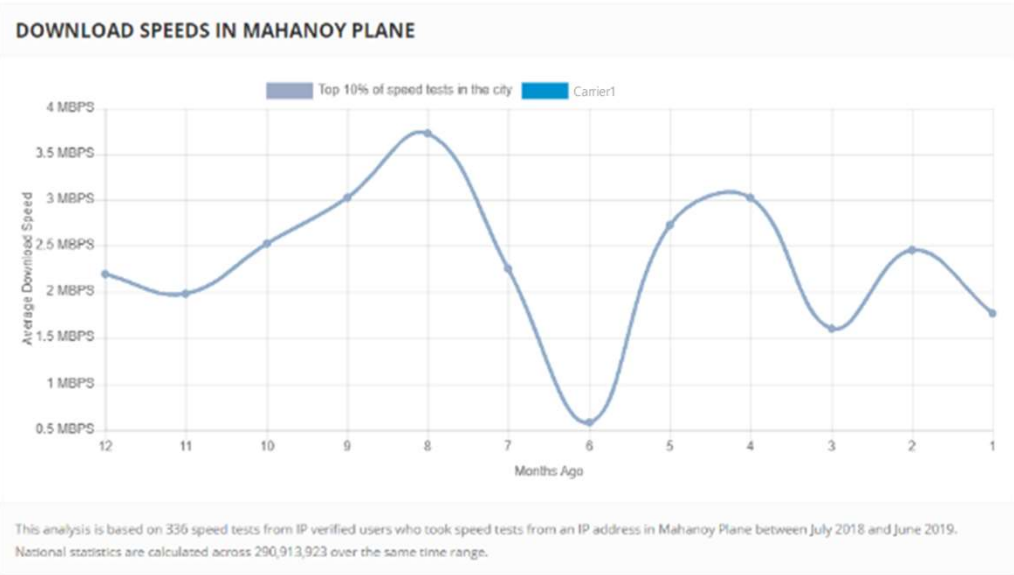
State	Zip code	FCC broadband availability 2019 report	Usage Feb 2019
PA	17949	91.8%	0.0%
VA	22742	100.0%	0.5%
WV	26386	100.0%	9.5%
FL	33890	94.0%	4.7%
OH	44076	92.1%	5.9%
OH	45856	98.3%	4.5%
IA	50514	98.0%	4.5%
MN	56282	100.0%	3.7%
KS	66079	100.0%	0.6%
AR	71956	97.3%	6.1%
AR	71968	99.1%	7.7%
OK	74332	99.9%	0.7%
TX	78118	100.0%	3.4%
TX	78151	99.6%	0.5%
TX	78941	99.5%	2.8%
CA	93602	93.7%	8.5%
CA	95638	100.0%	2.2%
OR	97456	94.7%	7.6%
WA	98855	97.9%	7.4%
WA	99122	100.0%	4.0%

Zip code: 17949 in Pennsylvania

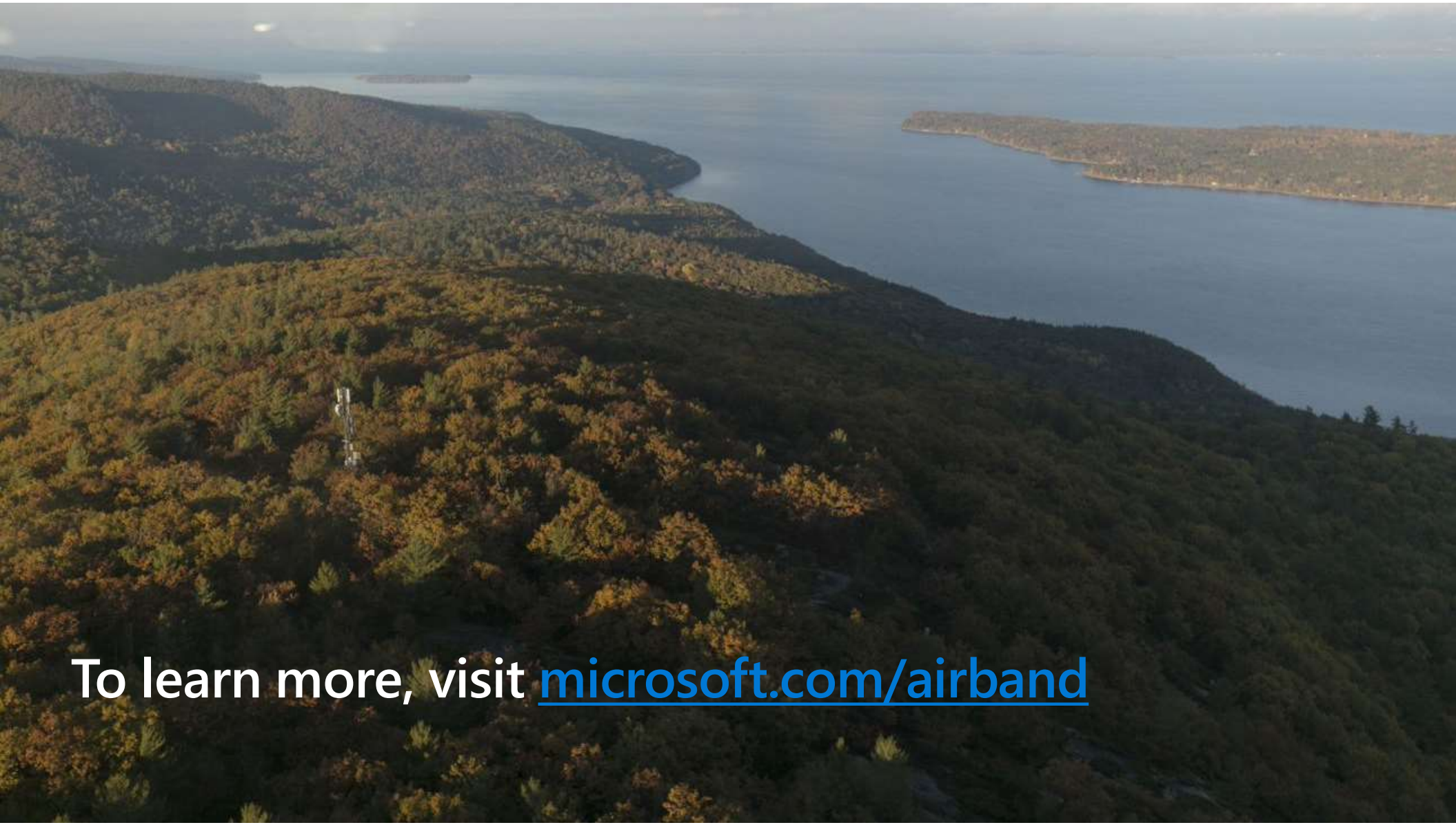
Estimated FCC broadband availability* (2019 report)	Estimated percent of people using the internet at broadband speeds using Microsoft data
91.8%	0.0%

* *zip codes may contain portions of multiple census tracts*

BROADBANDNOW®



Source: FCC 2019 broadband report, Microsoft data, and BroadbandNow.com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